

Appendix F

Business Case Alternatives A, B, and C

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Appendix F. Business Case Alternatives A, B, and C

This appendix provides a summary of the business case alternatives A, B, and C developed to address the Departmentwide need to identify cost-effective and efficient delivery methods for cross-cutting education and training learning activities to geographically dispersed students with a reduced dependency on travel. The alternatives represent different technical solutions for achieving DOE technology-supported learning goals using a corporate approach. These alternatives present options for expanding existing technology-supported learning capabilities and for converting traditional lecture-based and self-study courses and materials into advanced training technology formats.

F.1 Focus on Interactive Television (Alternative A)

F.1.1 Description

Based on media suitability characteristics derived from the application of the Distance Learning Appropriateness Screening Tool (DLAST), the goal projected for alternative A is to deliver a minimum of 150 cross-cutting learning activities using the following delivery technology mix:

- 75 (50 percent) via interactive television (ITV)
- 45 (30 percent) via multimedia
- 30 (20 percent) via Internet

The remaining learning activities, not delivered through advanced training technologies, are assumed to be delivered through traditional classroom or self-study methods.

Interactive television was selected as the focus for alternative A for the following reasons.

- Interactive television has a high level of maturity relative to multimedia and Internet technology.
- The DOE complex already has a well-established base of interactive television facilities. Approximately 26 additional downlinks are required to bring the Department to 93 percent coverage (measured by employees with access within their organization or site).
- The results of the initial application of DLAST indicate that of the 164 courses screened, interactive television is an excellent delivery method for 47 percent of the courses.

F.1.2 Approach for Meeting Training Needs

A 5-year phased approach is assumed for the implementation of alternative A starting in fiscal year 1998. This approach encompasses learning activity development and delivery, technology infrastructure acquisition, and organizational changes.

In the short term, both analog and digital satellite formats would be needed to accommodate current capabilities. Some DOE sites have analog and some have digital capabilities. Also, some sites have fixed dishes and some have steerable dishes. The long-term solution is to move toward a fully compatible, digital capability throughout the Department.

Establishment of partnering agreements to deliver education and training learning activities is an aspect of this alternative that has not been fully explored. Many full-service educational institutions, tele-education, and tele-training companies (such as Wescott Communications, Elkins Interactive, and IDTN) provide complete production and uplink services or some part of those services. The Government Alliance for Training and Education (GATE) successfully completed a multi-agency partnering pilot project that used interactive television to deliver ethics training to 7,000 federal employees.

The alternative A delivery method mix of learning activities for fiscal years 1998 through 2002 is shown in table F-1 at the end of this section. It is assumed that each learning activity will be delivered at a frequency of at least twice per year (initial) and possibly several times a year depending on demand for refresher training.

F.1.3 Platform Descriptions

Interactive Television. The interactive television platform will provide an appropriate infrastructure for the delivery of interactive cross-cutting education and training learning activities via satellite to remote locations. The platform for the first 3 years will be a satellite system that is compatible with the system in operation at the Central Training Academy (CTA) located at DOE facilities in Albuquerque, New Mexico. Compressed digital video transmission will be used to satisfy one-way video requirements. This transmission will be supported by terrestrial two-way audio and viewer response systems for student-instructor interactivity.

The interactive television satellite platform will consist of three basic components: broadcast studio; uplink-downlink capabilities; and receive site capabilities.

- A fully operational broadcast studio is located at CTA. It is assumed that this will be the primary DOE studio. Partnering agreements with educational, Government, and commercial vendors will be explored for potential shared use of other studios.
- The CTA satellite uplink consists of a transmission dish along with encoding hardware. It transmits one channel of live or recorded instruction to a satellite in geosynchronous orbit. Partnering agreements with educational, Government, and commercial vendors will be explored for potential shared use of other uplink capabilities.
- Each downlink will consist of a receive-only satellite dish and an integrated receiver/decoder. The Department already has 23 sites with satellite downlink capabilities that provide one-way video with two-way audio and one-way data.

- Each receive site will include, but not be limited to, television monitors, a viewer response system, video cassette recorder(s), and associated components.

Compressed video teleconferencing services (CVTS) and desktop video-conferencing will serve as secondary interactive television systems.

- Compressed video teleconferencing services offer two-way video and two-way audio. Many sites already have compressed video teleconferencing capabilities that could be used for training delivery.
- Desktop video provides two-way video with two-way audio and data. As a training delivery method this technology provides point-to-point connection that is ideal for remote, one-on-one instructor/student training. The most common DOE platform for desktop video is an Intel-based personal computer.

Multimedia. Ideally, courseware could be obtained/developed that will run on Windows-based personal computers, Macintosh, and Unix platforms with multimedia equipment. For this business case, it is assumed that a standardized platform will be necessary to ensure that cross-cutting CBT courseware can be delivered at all sites. For the cost analysis, an Intel-based personal computer is assumed to be the standard platform for multimedia delivery. A more detailed explanation of this platform is provided in alternative B (section F.2.3).

Internet. No standard requirement has been identified for Internet (NET)-based training except that it should not be DOS-based. The standardization of browsers and plug-ins is considered more essential.

F.1.4 Technology Acquisition

The following is a phased approach for the acquisition of the technology needed to successfully implement alternative A. Also provided are organizational issues, such as the establishment of partnering agreements, that would support the technical implementation plan.

Fiscal Year 1997 (not included in the analysis of benefits and costs)

- ITV: Install one uplink site at the Savannah River Operations Office as part of an arrangement negotiated with the National Technological University. Install five downlink sites.
- MM: Establish standards for formats, hardware, and authoring tools. Research/buy existing learning activities to meet current needs where possible.

Fiscal Year 1998

- ITV: Upgrade the infrastructure and install 25 additional downlink sites to service 90 percent of the DOE population. Establish new and expand existing partnering agreements for additional uplink capabilities.
- MM: Establish 50 learning centers with a minimum of 6 multimedia workstations in each center and distribute throughout the DOE complex. Expand courseware distribution/production capabilities.

Fiscal Year 1999

- ITV: Upgrade infrastructure by adding integrated receiver/decoders and site controllers to increase the number of learning activities that can be received from the satellite and add keypads and training space to increase student capacity. Establish partnering agreements for development and delivery of learning activities.
- MM: Establish 25 learning centers with a minimum of 6 multimedia workstations in each center and distribute throughout the DOE complex. Expand courseware distribution/production capabilities.
- NET: Achieve 80 percent connectivity of all sites across the DOE complex. It is assumed that this connectivity will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

Fiscal Year 2000

- ITV: Continue existing partnering agreements and add new partnering agreements as needed.
- MM: Establish 25 additional learning centers with a minimum of 6 multimedia workstations in each center and distribute throughout the DOE complex. Expand courseware distribution/production capabilities.
- NET: Achieve 100 percent connectivity of all sites. It is assumed that this connectivity will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

Fiscal Year 2001

- ITV: Minimal additional acquisition of technology. Continue existing partnering agreements and add new partnering agreements as needed.
- MM: Accelerate production of courseware and establish partnering agreements.

NET: Upgrade networks to provide Internet access to all desktops. It is assumed that this upgrade will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

Fiscal Year 2002

ITV: Minimal additional acquisition of technology.

MM: Minimal additional acquisition of technology.

NET: Upgrade desktop computers to support Internet access, where needed. It is assumed that this upgrade will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

Table F-1. Focus on Interactive Television (Alternative A)

	Year 1 - 1998	Year 2 - 1999	Year 3 - 2000	Year 4 - 2001	Year 5 - 2002	Totals for Methods
ITV Goal = 50% of courses appropriate for TSL delivery 1,835 average students/course each year	Install 25 additional downlink sites. Establish uplink partnering agreements.	Upgrade infrastructure. Establish development and delivery partnering agreements.	Expand partnering agreements.	Minimal acquisition of technology.	Minimal acquisition of technology.	
	Convert 15 courses	Convert 15 courses	Convert 15 courses	Convert 15 courses	Convert 15 courses	75 courses converted
	27,525 potential students	27,525 potential students	27,525 potential students	27,525 potential students	27,525 potential students	137,625 potential students
MM Goal = 30% of courses appropriate for TSL delivery 2,560 average students/course each year	Establish 50 learning centers with at least 6 multimedia workstations each.	Establish 25 learning centers with at least 6 multimedia workstations each.	Establish 25 learning centers with at least 6 multimedia workstations each.	Expand courseware production and distribution capabilities.	Minimal acquisition of technology.	
	Convert 7 courses. Buy additional existing courses.	Convert 7 courses	Convert 10 courses	Convert 10 courses	Convert 11 courses	45 courses converted
	17,920 potential students	17,920 potential students	25,600 potential students	25,600 potential students	28,160 potential students	115,200 potential students
Internet Goal = 20% of courses appropriate for TSL delivery 1,764 average students/course each year		Achieve 80% connectivity across DOE complex.	Achieve 100% connectivity across DOE complex.	Upgrade networks to provide Internet access to all desktops.	Upgrade desktop computers to support Internet access where necessary.	
		Convert 6 courses	Convert 8 courses	Convert 8 courses	Convert 8 courses	30 courses converted
		10,584 potential students	14,112 potential students	14,112 potential students	14,112 potential students	52,920 potential students
Totals for Each Year	22 courses converted	28 courses converted	33 courses converted	33 courses converted	34 courses converted	150 courses converted

F.2 Focus on Multimedia (Alternative B)

F.2.1 Description

Based on media suitability characteristics derived from the application of the Distance Learning Appropriateness Screening Tool (DLAST), the goal for alternative B is to deliver a minimum of 150 cross-cutting learning activities using the following delivery technology mix:

- 19 (13 percent) via interactive television
- 110 (73 percent) via multimedia
- 21 (14 percent) via Internet

The remaining learning activities, not delivered through advanced training technologies, are assumed to be delivered through traditional classroom or self-study methods.

Multimedia was selected as the focus for alternative B for the following reasons:

- Multimedia delivery has the advantage of always being available for students (on-demand training) and is highly interactive and self-paced.
- Cost savings from multimedia can be realized quickly and can be substantiated across the entire complex.
- Multimedia courseware can be developed by existing contractors or closely associated vendors already in place. These groups are capable and familiar with the needs of such learning activities.
- Generic courseware is widely available from commercial vendors.
- The results of the initial application of DLAST indicate that of the 164 courses screened, multimedia is an excellent delivery method for 71 percent of the courses.
- Multimedia learning centers and delivery hardware are in place at several DOE contractor locations. The following list (comprehensive list not available) identifies some of the known sites where existing multimedia learning centers and hardware are dedicated to education and training delivery.

Fernald - 25 systems

Hanford - 3 large learning centers; 20 systems

Idaho National Engineering Lab - approximately 6 learning centers; 20 systems

Lawrence Livermore National Lab (number of systems unknown)

Los Alamos National Lab (number of systems unknown)

Mound - 10 systems

Nevada Operations Office (number of systems unknown)

Oak Ridge (number of systems unknown)

Rocky Flats - 20 systems
Sandia National Lab (number of systems unknown)
Savannah River - 8 learning centers
West Valley - 6 systems

F.2.2 Approach for Meeting Training Needs

A 5-year phased approach is assumed for the implementation of alternative B starting in fiscal year 1998. This approach encompasses learning activity development and delivery, technology infrastructure acquisition, and organizational changes.

To enable widespread implementation of multimedia delivery for cross-cutting education and training learning activities as proposed in this alternative, a set of standards will need to be established in fiscal year 1997. A team of subject matter experts would be chartered to evaluate and adopt appropriate standards. One multimedia delivery hardware standard that will be considered has been proposed by the TRADE Special Interest Group for Advanced Training Technologies (SIGATT). The standards will evolve over the course of the 5-year implementation approach and would be reviewed and upgraded systematically to maximize utility, quality of training, and compatibility of courseware.

The expansion of existing and the acquisition of additional multimedia learning centers are important elements of this alternative. It is estimated that approximately 1,200 multimedia-equipped computer workstations would be needed in 200 learning centers across the Department by the year 2002 to accommodate the training requirements established in this alternative. Each learning center would contain a minimum of six multimedia-equipped computer workstations. Of that number, approximately 900 would need to be acquired in the first 3 years of the implementation plan. During the last 2 years, the emphasis will begin to shift from adding more multimedia-equipped computers to learning centers to upgrading individual workstations. It is assumed that much of this upgrading will occur at an organizational level that is independent of education and training budgets. Organizations will naturally upgrade to take advantage of emerging technologies and to replace obsolete equipment. Guidelines will be used in procurement systems to ensure compatibility is maintained.

Establishment of partnering agreements to develop and deliver education and training learning activities is a significant aspect of this alternative that has not been fully explored. One potential partnering opportunity is with the Federal Aviation Administration, which has extensive experience in CBT courseware development.

The alternative B delivery method mix of learning activities for fiscal years 1998 through 2002 is shown in table F-2 at the end of this section. To maximize effective use of multimedia, it is assumed that learning activities developed apply to a large population (greater than 500) and have frequent refresher cycles (1-2 years).

F.2.3 Platform Descriptions

Interactive Television. In the short term, both analog and digital satellite formats would be needed to accommodate current capabilities. The long-term solution is to move toward a fully compatible, digital capability throughout the Department. The technology for the first 3 years would be a Central Training Academy (CTA)-compatible satellite system with compressed video teleconferencing services (CVTS) and desktop video-conferencing as secondary interactive television delivery systems. A more detailed explanation of this platform is provided in alternative A (section F.1.3).

Multimedia. The multimedia/CBT delivery platform includes a personal computer, digital audio, compact disc read-only memory (CD-ROM), color monitor, high resolution graphics, and a touch screen (optional). For the cost analysis, an Intel-based personal computer is assumed to be the standard platform for multimedia delivery.

The multimedia/CBT courseware development platform includes authoring software and other development software that enhances courseware development and reduces programming time. Ideally, courseware could be obtained/developed that will run on Windows-based personal computers, Macintosh, and Unix platforms with multimedia equipment. A standardized platform may be a key element to ensure that cross-cutting CBT courseware can be delivered at all sites. If a single platform is required, it will most likely be an Intel-based Windows platform.

The types of multimedia vary in complexity and length of time to develop from simple hypertext systems to elaborate model-based simulations. The following multimedia types were considered for this alternative.

- Slide shows and linear CBT
- Drill and practice
- Emersion technology
- Hypertext and branching CBT
- Canned simulations
- Free-play simulations
- Virtual reality

Learning activity conversion to a specific type of multimedia needs to be evaluated on a case-by-case basis. Factors to consider include the stability of the content, potential complexity, the amount of video/graphics, the amount of interactivity, and other media selection criteria as identified in the DLAST. The estimated average labor hours to build learning activities range from less than 100 hours per student contact hour for hypertext to as much as 1,000 hours for interactive simulations and virtual reality. Using an average labor rate of \$50/hour, these labor hours represent a range of less than \$5,000/hour for simple hypertext up to \$50,000/hour for complex simulations. Many sources reporting multimedia development data indicate that they expect their costs to decrease by as much as 20 percent once their development experience with the medium matures.

Internet. No standard requirement has been identified for Internet (NET)-based training except that it should not be DOS-based. The standardization of browsers and plug-ins is considered more essential.

F.2.4 Technology Acquisition

The following is a phased approach for the acquisition of the technology needed to successfully implement alternative B. Also provided are organizational issues, such as the establishment of partnering agreements, that would support the technical implementation plan.

Fiscal Year 1997 (not included in the analysis of benefits and costs)

- ITV: Install one uplink site at the Savannah River Operations Office as part of an arrangement negotiated with the National Technological University. Install five downlink sites.
- MM: Establish standard hardware platform. Survey all sites for present capability and current assets. Identify sites performing courseware development and catalog their capabilities. Align all sites presently using multimedia to the coordination of learning activity development and deployment.

Fiscal Year 1998

- ITV: Install 20 downlink sites. Upgrade infrastructure by adding integrated receiver/decoders and site controllers to increase the number of learning activities that can be received from the satellite and add keypads and training space to increase student capacity. Begin to explore partnering opportunities for additional uplink capabilities.
- MM: Establish 100 learning centers throughout the DOE complex. Acquire and install a minimum of six multimedia workstations in each learning center. Solicit existing courseware from all DOE sites. Identify subject matter experts and establish courseware development and delivery method Centers of Excellence.

Fiscal Year 1999

- ITV: Upgrade infrastructure by adding integrated receiver/decoders and site controllers to increase the number of learning activities that can be received from the satellite and add keypads and training space to increase student capacity. Establish partnering agreements for interactive television development and delivery.
- MM: Establish 50 learning centers throughout the DOE complex. Acquire and install a minimum of six multimedia workstations in each learning center.

NET: Achieve 80 percent connectivity of all sites across the DOE complex. It is assumed that this connectivity will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

Fiscal Year 2000

ITV: Upgrade infrastructure by adding integrated receiver/decoders and site controllers to increase the number of learning activities that can be received from the satellite and add keypads and training space to increase student capacity. Evaluate existing partnering agreements and add new partnering agreements as needed.

MM: Establish 50 learning centers throughout the DOE complex. Acquire and install a minimum of six multimedia workstations in each learning center. Begin upgrading individual workstations. It is assumed that this upgrade will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

NET: Achieve 100 percent connectivity of all sites. It is assumed that this connectivity will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives. Purchase site licenses for browser software taking advantage of Departmentwide purchasing agreements for economies of scale.

Fiscal Year 2001

ITV: Minimal additional acquisition of technology. Evaluate existing partnering agreements and add new partnering agreements as needed.

MM: Continue to upgrade individual workstations. It is assumed that this upgrade will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

NET: Upgrade networks to provide Internet access to all desktops. It is assumed that this upgrade will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

Fiscal Year 2002

ITV: Minimal additional acquisition of technology. Significant vendor interest should greatly improve opportunities to purchase vendor-produced courseware.

MM: Minimal additional acquisition of technology. Anticipate that individual workstation platform upgrades will be funded by each site/organization to meet planned populations and delivery demand. Significant vendor interest should greatly improve opportunities to purchase vendor-produced courseware.

NET: Upgrade desktop computers as needed to support Internet access. Anticipate that individual workstation platform upgrades will be funded by each site/organization to meet planned populations and delivery demand.

Table F-2. Focus on Multimedia (Alternative B)

	Year 1 - 1998	Year 2 - 1999	Year 3 - 2000	Year 4 - 2001	Year 5 - 2002	Totals for Methods
ITV Goal = 13% of courses appropriate for TSL delivery 1,835 average students/course each year	Install 20 downlinks. Upgrade infrastructure. Explore uplink partnering agreements.	Upgrade infrastructure. Establish partnering agreements.	Upgrade infrastructure. Add partnering agreements.	Minimal acquisition of technology.	Minimal acquisition of technology. Significant vendor courseware.	
	Convert 3 courses	Convert 4 courses	Convert 4 courses	Convert 4 courses	Convert 4 courses	19 courses converted
	5,505 potential students	7,340 potential students	7,340 potential students	7,340 potential students	7,340 potential students	34,865 potential students
MM Goal = 73% of courses appropriate for TSL delivery 2,560 average students/course each year	Establish 100 learning centers with at least 6 multimedia workstations each. Establish Centers of Excellence.	Add 50 learning centers with at least 6 multimedia workstations each.	Add 50 learning centers with at least 6 multimedia workstations each. Begin upgrading individual workstations.	Upgrade individual workstations.	Minimal acquisition of technology. Significant vendor courseware.	
	Convert 15 courses	Convert 20 courses	Convert 25 courses	Convert 25 courses	Convert 25 courses	110 courses converted
	38,400 potential students	51,200 potential students	64,000 potential students	64,000 potential students	64,000 potential students	281,600 potential students
Internet Goal = 14% of courses appropriate for TSL delivery 1,764 average students/course each year		Achieve 80% connectivity across DOE complex.	Achieve 100% connectivity across DOE complex. Purchase site licenses for browser software.	Upgrade networks to provide Internet access to all desktops	Upgrade desktop computers to support Internet access where necessary	
		Convert 4 courses	Convert 5 courses	Convert 5 courses	Convert 7 courses	21 courses converted
		7,056 potential students	8,820 potential students	8,820 potential students	12,348 potential students	37,044 potential students
Totals for Each Year	18 courses converted	28 courses converted	34 courses converted	34 courses converted	36 courses converted	150 courses converted

F.3 Focus on High-Speed Networks (Alternative C)

F.3.1 Description

Based on media suitability characteristics derived from the application of the Distance Learning Appropriateness Screening Tool (DLAST), the goal for alternative C is to deliver a minimum of 150 cross-cutting learning activities using the following delivery technology mix:

- 19 (13 percent) via interactive television
- 110 (73 percent) via multimedia
- 21 (14 percent) via Internet

The remaining learning activities, not delivered through advanced training technologies, are assumed to be delivered through traditional classroom and self-study methods.

High-speed networks were selected as the focus for alternative C for the following reasons:

- High-speed network delivery has the advantage of always being available for students (on-demand training).
- Courseware development can be done by existing contractors or closely associated vendors already in place. These groups are capable and familiar with the needs of such learning activities.
- As high-speed network technology matures, increased bandwidth will enable the seamless distribution of both multimedia and Internet courseware via high-speed networks.
- The results of the initial application of DLAST indicate that of the 164 courses screened, a combination of multimedia and Internet are an excellent delivery method for 83 percent of the courses.

F.3.2 Approach for Meeting Training Needs

A 5-year phased approach is assumed for implementation of alternative C starting in fiscal year 1998. This approach encompasses learning activity development and delivery, technology infrastructure acquisition, and organizational changes.

This alternative is very similar to alternative B, which focuses on the implementation of multimedia delivery methods. The primary difference between the two alternatives is the almost seamless merging of multimedia and Internet to high-speed network delivery in the fourth and fifth years of the implementation plan. Even some of the learning activities delivered via interactive television could be converted for delivery via high-speed network. For this alternative to be viable, it is assumed that as high-speed network technology matures, DOE organizations and sites will upgrade their networks and install fiber optic cable. As bandwidth increases, the use of high-speed networks as the "ultimate" delivery method becomes a reasonable option.

Standards and technologies for high-speed networks are evolving. This business case assumes, for the purpose of doing an analysis of benefits and costs, that fiber-optic cable is installed at each site up to the final nodes before distribution to the desktop. The final distribution network is assumed to be an Ethernet system.

While technology-supported learning is a good application of high-speed networks, an assumption has been made in this business case that technology-supported learning on its own does not provide adequate justification for installation of high-speed networks where they presently do not exist. It assumes that the need for high-speed networks will have other drivers in addition to technology-supported learning for justifying the investment.

Some sites in the DOE complex may not have access to a high-speed network backbone. Therefore, it would not be feasible to install such a network at those sites. Other forms of technology-supported learning (e.g., interactive television, multimedia/CBT, and low-speed Internet) would continue to be used at these sites.

Establishment of partnering agreements to deliver education and training learning activities is an aspect of this alternative that has not been fully explored.

The alternative C delivery method mix of learning activities for fiscal years 1998 through 2002 is shown in table F-3 at the end of this section.

F.3.3 Platform Descriptions

Interactive Television. In the short term, both analog and digital satellite formats would be needed to accommodate current capabilities. The long-term solution is to move toward a fully compatible, digital capability throughout the Department. The technology for the first 3 years would be a Central Training Academy (CTA)-compatible satellite system with compressed video teleconferencing services (CVTS) and desktop video-conferencing as secondary interactive television delivery systems. A more detailed explanation of this platform is provided in alternative A (section F.1.3).

Multimedia. Ideally, courseware could be obtained/developed that will run on Windows-based personal computers, Macintosh, and Unix platforms with multimedia equipment. A standardized platform may be a key element to ensure that cross-cutting CBT courseware can be delivered at all sites. For the cost analysis, an Intel-based personal computer is assumed to be the standard platform for multimedia delivery. A more detailed explanation of this platform is provided in alternative B (section F.2.3).

Internet. No standard requirement has been identified for Internet-based training except that it should not be DOS-based. The standardization of browsers and plug-ins are considered more essential.

The following types of Internet World Wide Web (WWW) pages are considered appropriate for delivery of education and training learning activities.

- Static Web pages are best for relatively low technology applications that are low in cost to convert, such as study guides or textbooks. Examples of appropriate types of training include slide shows and linear CBT, canned simulations, hypertext and branching CBT, and text-only materials.
- Dynamic Web pages are best for interactive applications such as testing, practice, and data base lookup applications. Examples of appropriate types of training include server-based common gateway interface scripted, imbedded JAVA or shockwave applets/scripts, drill and practice, and free-play simulations.

F.3.4 Technology Acquisition

The following is a phased approach for the acquisition of the technology needed to successfully implement alternative C. Also provided are organizational issues, such as the establishment of partnering agreements, that would support the technical implementation plan.

Fiscal Year 1997 (not included in the analysis of benefits and costs)

- ITV: Install one uplink site at the Savannah River Operations Office as part of an arrangement negotiated with the National Technological University. Install five downlink sites.
- MM: Establish standard hardware platform. Survey all sites for present capability and current assets. Identify sites performing courseware development and catalog their capabilities. Align all sites presently using multimedia to the coordination of learning activity development and deployment.

Fiscal Year 1998

- ITV: Install 20 downlink sites. Upgrade infrastructure by adding integrated receiver/decoders and site controllers to increase the number of learning activities that can be received from the satellite and add keypads and training space to increase student capacity. Begin to explore partnering opportunities for additional uplink capabilities.
- MM: Establish 100 learning centers throughout the DOE complex. Acquire and install a minimum of six multimedia workstations in each learning center. Solicit existing courseware from all DOE sites. Identify subject matter experts and establish courseware development and delivery method Centers of Excellence.
- NET: Establish standards for the WWW browser software. Adopt standards for the hypertext markup language (HTML) formats used within the DOE complex. Achieve 80 percent Internet connectivity across the DOE complex. It is assumed that this connectivity will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

Fiscal Year 1999

- ITV: Upgrade infrastructure by adding integrated receiver/decoders and site controllers to increase the number of learning activities that can be received from the satellite and add keypads and training space to increase student capacity. Establish partnering agreements for delivery of learning activities.
- MM: Establish 50 learning centers throughout the DOE complex. Acquire and install a minimum of six multimedia workstations in each learning center.
- NET: Achieve 100 percent connectivity of all sites across the DOE complex. It is assumed that this connectivity will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives. Purchase site licenses for browser software, including plug-ins necessary to deliver CBT/interactive television learning activities.

Fiscal Year 2000

- ITV: Upgrade network infrastructure. It is assumed that this upgrade will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.
- MM: Establish 50 learning centers throughout the DOE complex. Acquire and install a minimum of six multimedia workstations in each learning center. Begin upgrading individual workstations. It is assumed that this upgrade will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.
- NET: Purchase and install network upgrades at each site where necessary to provide high-speed digital transmission. It is assumed that this upgrade will be achieved through other DOE-wide or organizational level telecommunications enhancement initiatives.

Fiscal Year 2001

- ITV: Establish bridges to channel interactive television broadcast to the desktop.
- MM: Merge multimedia delivery with Internet capabilities and deliver learning activities via CD-ROM or the high-speed network.
- NET: Begin delivery of CBT learning activities via Internet on the high-speed network.

Fiscal Year 2002

- ITV: Convert some interactive television for delivery via high-speed network and merge with Internet capabilities.
- MM: Continue to merge multimedia delivery with Internet capabilities and deliver learning activities via CD-ROM or the high-speed network.
- NET: Begin delivery of interactive television/video via Internet on the high-speed network.

Table F-3. Focus on High-Speed Networks (Alternative C)

	Year 1 - 1998	Year 2 - 1999	Year 3 - 2000	Year 4 - 2001	Year 5 - 2002	Totals for Methods
ITV Goal = 13% of courses appropriate for TSL delivery 1,835 average students/course each year	Install 20 downlinks. Upgrade infrastructure. Explore uplink partnering agreements.	Upgrade infrastructure. Establish partnering agreements for course delivery.	Upgrade network infrastructure (see Internet block below)	Establish bridges to channel ITV broadcast to desktop	Convert some ITV for delivery via high-speed network and merge with Internet capabilities	
	Convert 3 courses	Convert 4 courses	Convert 4 courses	Convert 4 courses	Convert 4 courses	19 courses converted
	5,505 potential students	7,340 potential students	7,340 potential students	7,340 potential students	7,340 potential students	34,865 potential students
MM Goal = 73% of courses appropriate for TSL delivery 2,560 average students/course each year	Establish 100 learning centers with at least 6 multimedia workstations each. Establish Centers of Excellence.	Establish 50 learning centers with at least 6 multimedia workstations each.	Establish 50 learning centers with at least 6 multimedia workstations each. Begin upgrading individual workstations.	Merge with Internet capabilities. Deliver via CD-ROM or high-speed network.	Continue merge with Internet capabilities; Deliver via CD-ROM or high-speed network.	
	Convert 15 courses	Convert 20 courses	Convert 25 courses	Convert 25 courses	Convert 25 courses	110 courses converted
	38,400 potential students	51,200 potential students	64,000 potential students	64,000 potential students	64,000 potential students	281,600 potential students
Internet Goal = 14% of courses appropriate for TSL deliver 1,764 average students/course each year	Establish standards for WWW browser software. Adopt standards for HTML formats used for TSL. Achieve 80% connectivity across DOE.	Achieve 100% connectivity across DOE complex. Purchase site licenses for browser software, including plug-ins necessary to deliver CBT/ITV.	Purchase and install network upgrades at each site where necessary to provide high-speed digital transmission.	Begin delivery of CBT via Internet on the high-speed network.	Begin delivery of ITV/video via Internet on the high-speed network.	
		Convert 4 courses	Convert 5 courses	Convert 5 courses	Convert 7 courses	21 courses converted
		7,056 potential students	8,820 potential students	8,820 potential students	12,348 potential students	37,044 potential students
Totals for Each Year	18 courses converted	28 courses converted	34 courses converted	34 courses converted	36 courses converted	150 courses converted

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